**COURSES WITH ENERGY THEME AND CONTENT**

**Survey Taken 2011 - 2012**

Here the Energy Council provides an inventory of existing courses connected to the themes of energy. The inventory was prepared by first searching for the word “Energy” in all course titles and abstracts. Associate Deans and other faculty members then provided course lists to further enhanced the initial inventory. In general, all courses recommended for the inventory are included, and no courses were culled from the listings.

We recognize the course inventory is not complete, and will continue to develop the list. Also, courses that are “on the books” and listed may no longer be offered. Finally, we did not list special topics courses, seminars, thesis, or distance learning courses. Even so, we think the inventory is useful and shows the general areas where NC State University course offerings are strong (energy theory, production, and use).

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| --- | --- | --- | --- | --- | --- |
| Energy Theme | Undergraduate  Courses | Graduate  Courses | 400/500  Courses | Total  Courses | Colleges |
|  |  |  |  |  |  |
| Energy Theory | 26 | 29 | 0 | 55 | ENG,PAMS |
| Energy Production | 12 | 19 | 6 | 37 | ENG,PAMS, CALS |
| Energy Distribution | 2 | 2 | 0 | 4 | ENG |
| Energy Use | 24 | 34 | 1 | 59 | ENG, Textiles |
| Energy Social Sci. | 1 | 0 | 0 | 0 | CHASS |
| Energy as Partial  Course Content | 40 | 25 | 2 | 67 | CALS,Design,ENG,CHASS,  COM,CNR,PAMS |
|  |  |  |  |  |  |
| Total | 105 | 109 | 9 | 223 |  |

1. Energy Theory (55 Total, Depts. = BAE, CH, CHE, ECE, MAE, MSE, NE, PY)

BAE 344 Circuits and Controls

CH 737 Quantum Chemistry

CH 743 Electrochemistry

CHE 205 Chemical Process Principles

CHE 225 Introduction to Chemical Engineering Analysis

CHE 311 Transport Processes I

CHE 312 Transport Processes II

CHE 315 Chemical Process Thermodynamics

CHE 316 Thermodynamics of Chemical and Phase Equilibria

CHE 435 Process Systems Analysis and Control

CHE 446 Design and Analysis of Chemical Reactors

CHE 450 Chemical Engineering Design I

CHE 451 Chemical Engineering Design II

CHE 455 Polymer Technology and Engineering

CHE 460 Chemical Processing of Electronic Materials

CHE 461 Polymer Sciences and Technology

CHE 462 Colloidal and Nanoscale Engineering

CHE 543 Polymer Science and Technology

CHE 551 Biochemical Engineering

CHE 713 Thermodynamics I

CHE 717 Chemical Reaction Engineering

CHE 718 Advanced Chemical Reaction Engineering

CHE 719 Electrochemical Systems Analysis

CHE 760 Photochemical Engineering

CHE 769 Polymers, Surfactants and Colloidal Materials

ECE 303 Electromagnetic Fields

ECE 540/740 Electromagnetic Fields

MAE 301 Engineering Thermodynamics I

MAE 302 Engineering Thermodynamics II

MAE 310 Heat Transfer Fundamentals

MAE 501 Advanced Engineering Thermodynamics

MAE 504 Fluid Dynamics Of Combustion I

MAE 505 Heat Transfer Theory and Applications

MAE 560 Computational Fluid Mechanics and Heat Transfer

MAE 702 Statistical Thermodynamics

MAE 704 Fluid Dynamics of Combustion II

MAE 707 Advanced Conductive Heat Transfer

MAE 708 Advanced Convective Heat Transfer

MAE 709 Advanced Radiative Heat Transfer

MAE 770 Computation of Reacting Flows

MSE 331 Electronic Properties of Materials

MSE 333 Electronic Properties Lab

MSE 460 Microelectronic Materials

MSE 704 Electrical, Optical and Magnetic Properties of materials

NE 528 Introduction to Plasma Physics and Fusion Energy

NE 729/755 Reactor Theory and Analysis

NE 777 Exact and Approximate Solutions in Particle Transport Theory

NE 780 Magnetohydrodynamics & Transport in Plasmas

NE 781 Kinetic Theory, Waves, & Non-Linear Effects in Plasmas

PY 413 Thermal Physics

PY 463 Fluid Physics

PY 414 Electromagnetism I

PY 415 Electromagnetism II

PY 785 Advanced Electricity and Magnetism I

PY 786 Advanced Electricity and Magnetism II

2. Energy Production (37 Total, Depts. = ANS/NTR, CE, ECE, MAE, MEA, NE, PY)

ANS/NTR 709 Energy Metabolism

CE 476/576 Air Pollution Control

CE/MEA 479/579 Air Quality

ECE 305 Electric Power Systems

ECE 451Power System Analysis

MAE 407 Steam and Gas Turbines

MAE 412 Design of Thermal System

MAE 421 Design of Solar Thermal Systems

MAE 503 Advanced Power Plants

MEA 417 The Geology of Fossil Fuel Deposits

MEA 796 Exploration and Engineering Geophysics

NE 201 Introduction to Nuclear Engineering

NE 235 Nuclear Reactor Operations Training

NE 301 Fundamentals of Nuclear Engineering

NE 400/500 Nuclear Reactor Energy Conversion

NE 401 Reactor Analysis and Design

NE 402/502 Reactor Engineering

NE 404/504 Radiation Safety and Shielding

NE 405/505 Reactor Systems

NE 409/509 Nuclear Materials

NE 412/512 Nuclear Fuel Cycles

NE 418 Nuclear Power Plant Instrumentation

NE 419 Introduction to Nuclear Energy

NE 520 Radiation and Reactor Fundamentals

NE 721 Nuclear Laboratory Fundamentals

NE 722 Reactor Dynamics and Control

NE 723 Reactor Analysis

NE 724 Reactor Heat Transfer

NE 726 Radioisotopes Measurement Applications

NE 727 Nuclear Engineering Analysis

NE 730 Radiological Assessment

NE 746 Fusion Energy Engineering

NE 751 Nuclear Reactor Design Calculations

NE 752 Thermal Hydraulic Design Calculations

NE 753 Reactor Kinetics and Control

NE 761 Radiation Detection

PY 528 Introduction to Plasma Physics and Fusion Energy

3. Energy Distribution and Storage (Total 4, Dept. = ECE)

ECE 211 Electric Circuits

ECE 453 Distribution System Analysis, Design and Operation

ECE 721 Advanced Microarchitecture

ECE 736 Power System Stability and Control

4. Energy Use (Total = 59, Depts. = BAE, CE, ECE, MAE, NE, TC, TE, TED)

BAE 311 Agricultural Machinery and Power Units

BAE 343 Agricultural Electrification

BAE 462 Machinery Design and Applications

CE 367 Mechanical and Electrical Systems in Buildings

CE 465 Construction Equipment and Methods

ECE 200 Introduction to Signals, Circuits and Systems

ECE 211 Electric Circuits

ECE 302 Microelectronics

ECE 303/540 Electromagnetic Fields

ECE 305 Electric Power Systems

ECE 331 Principles of Electrical Engineering I

ECE 403 Electronics Engineering

ECE 404 Introduction to Solid-State Devices

ECE 422 Transmission Lines and Antennas for Wireless

ECE 437 Distributed Real Time Control Systems

ECE 442 Integrated Circuit Technology and Fabrication

ECE 451 Power System Analysis

ECE 453 Distribution System Analysis, Design and Operation

ECE 528 Semiconductor Characterization

ECE 530 Physical Electronics

ECE 531 Principles of Transistor Devices

ECE 532 Principles of Microwave circuits

ECE 535 Design of Electromechanical Systems

ECE 538 Integrated Circuits Technology and fabrication

ECE 544 Design of Electronic Packaging and Interconnects

ECE 550 Power System Operation and Control

ECE 553 Semiconductor Power Devices

ECE 555 Computer Control of Robots

ECE 556 Agent-based Mechatronics Systems

ECE 557 Principles of MOS Transistors

ECE 703 Integrated Bioelectronic Circuits

ECE 718 Computer-Aided Circuit Analysis

ECE 719 Microwave Circuit Design Using Scattering Parameters

ECE 722 Electronic Properties of Solid-State Materials

ECE 723 Optical Properties of Semiconductors

ECE 724 Electronic Properties of Solid-State Devices

ECE 725 Quantum Engineering

ECE 727 Semiconductor Thin Film Technology

ECE 733 Digital Electronics

ECE 734 Switchmode DC-To-DC Converters

ECE 736 Power System Stability and Control

ECE 739 Integrated Circuits Technology and Fabrication Laboratory

MAE 403 Air Conditioning

MAE 406 Energy Conservation in Industry

MAE 408 Internal Combustion Engine Fundamentals

MAE 475 Propulsion

MAE 535 Design of Electromechanical Systems

MAE 541 Advanced Machine Design I

NE 202 Radiation Sources, Interaction and Detection

NE 531 Nuclear Waste Management

NE 585 Management of Hazardous Chemical and Radioactive Wastes

NE 757 Radiation Effects on Materials

NE 762 Radioisotope Applications

NE 770 Nuclear Radiation Attenuation

NE 771 Advanced Nuclear Waste Management

NE 772 Environmental Exposure and Risk Analysis

TC 771 Polymer Microstructures, Conformations, and Properties

TE 303 Thermal Processes in Textile Engineering

TED 276 Transportation Technology: Energy, Power and Infrastructures

5. Energy Policy, Economics, and Law (Total = 1, Dept. = HI)

HI 465 Oil and Crisis in the Gulf

6. Energy as Integral Theme (Total 66, Depts. = ANS/NTR, ARC, BIO, BO, CE, CH, CHE, COM, ECG, ES, FOR, HS, IDS, IE, MAE, MEA, MSE, NR, NS, PS, SSC, STS, WP, WPS)

ANS/NTR 550 Applied Ruminant Nutrition

ANT 450/550 Environmental Anthropology

ARC 211 Natural Systems and Architecture

ARC 302 Architectural Design: Technology

ARC 405 Architectural Design Fundamentals: Technology

BIO 105 Biology in the Modern World

BO 321 Introduction to Whole Plant Physiology

BO 360 Introduction to Ecology

CE 213 Introduction to Mechanics

CE 382 Hydraulics

CE 470 Physical Processes of Environmental Engineering

CE 577 Engineering Principles Of Solid Waste Management

CE 580 Flow in Open Channels

CE 715 Advanced Strength of Materials

CE 721 Matrix and Finite Element Structural Analysis

CE 759 Inelastic Behavior of Construction Materials

CE 765 Construction Equipment Systems

CE 476 Air Pollution Control

CE 576 Engineering Principles Of Air Pollution Control

CH 100 Chemistry and Society

CHE 225 Introduction to Chemical Engineering Analysis

CHE 715 Transport Phenomena

COM 436 Environmental Communication

EC 336 Introduction to Resource and Environmental Economics

EC 436 Environmental Economics

EC 472 Rise of Industrialism

ECG 515 Environmental and Resource Policy

ES 100 Introduction to Environmental Sciences

FOR 753 Environmental Remote Sensing

FS 231 Food Engineering

HI 341Technology in History

HI 440 American Environmental History

HI 480/580 Scientific Revolution: 1300 - 1700

HI 485/585 History of American Technology

HS 432 Introduction to Permaculture

IDS 303 Humans and the Environment

IE 741 Occupational Safety Engineering

MAE 543 Fracture Mechanics

MAE 556 Mechanics of Ideal Fluids

MAE 713 Analytical Methods in Structural Vibration

MAE 731 Materials Processing by Deformation

MAE 776 Turbulence

MEA 100 Earth Systems Science  
MEA 202 Geology II: Historical  
MEA 213 Introduction to Atmospheric Sciences I  
MEA 250 Introduction to Coastal Environments  
MEA 300 Environmental Geology  
MEA 320 Fundamentals of Air Quality  
MEA 323 Earth Systems Chemistry  
MEA 321 Fundamentals of Air Quality and Climate Change  
MEA 412 Atmospheric Thermodynamics  
MEA 425 Introduction to Air Chemistry  
MEA 450 Introductory Sedimentary Petrology/Stratigraphy  
MEA 451 Structural Geology  
MEA 455 Micrometeorology  
MEA 460 Physical Oceanography  
MEA 463 Fluid Physics  
MEA 469 Ecology of Coastal Resources  
MEA 471 Exploration and Engineering Geophysics   
MEA/CE 479 Air Quality  
MEA 485 Introduction to Hydrogeology  
MEA 525 Introduction to Air Chemistry  
MEA 570 Geological Oceanography  
MEA 580 Air Quality Modeling and Forecasting   
MEA 582 Geospatial Modeling and Analysis

MEA 593 Wind Power Meteorology

MEA/CE779Advanced Air Quality

MSE 715 Fundamentals of Transmission Electron Microscopy

MSE 731 Materials Processing by Deformation

NR 303 Humans and the Environment

NR 571 Current Issues in Natural Resource Policy

NS 220 Naval Ships Engineering Systems

PA 550 Environmental Policy

PS 314 Science, Technology and Public Policy

PS 320 U.S. Environmental Law and Politics

SOC 450 Environmental Sociology

SSC 511 Soil Physics

STS 303 Humans and the Environment

STS 412 Entering the 21st Century: Ag., Tech. & Environmental Perspective

STS 484 Cross Cultural Technology Transfer

WP 472 Paper Process Analysis

WPS 760 Advanced Pulp and Paper Process Analysis

7. Desired, Not Offered (Examples)

*Energy Theory*

Principles of Storing Energy

Foundations of Energy Distribution

Systems Analysis of Transportation

*Energy Production*

Geothermal Energy

Hydropower

Alternative Energy

Wind Energy

Fuel Cell Technology

Oil: International Evolution

Biogeochemical Cycles – Carbon and Energy

Greenhouse Gas Emissions, Control, and Prevention

Coal: Friend or Foe?

Nuclear Power: Infinite Energy for the Future?

*Energy Distribution and Storage*

NIMBY, BANANA, and NOPE: Politics and Social dynamics of Locating a New Power Plant

Electrical Storage Devices

The Grid: Design and Stability

*Energy Use*

Energy, Ecology and You

Environmental Rating Systems for Buildings

Green Engineering and Environmental Compliance

Biofuels: Production, Transport, and End Use

Energy Mix Modeling: How to Design and Implement a National Energy System

Life Cycle Inventory and Impact Assessment

Residential Energy

Commercial Energy

Transportation Energy

Energy and Environmental Technology Innovation

Learning from Energy Accidents and Failures

Potential Significance of Alternative Energy Sources

Energy Conservation with Better Materials and Design

Gasification Technology

Diesel Engines: Tier 0 to Tier 4, and Beyond

Vehicle Fuels and Emissions

Redesign: The key to Converting Existing Buildings for Energy Efficiency

Energy Analysis Tools for Sustainable Building Design

Synthetic Fuels: Technology and Policy

*Energy Policy, Economics, and Law*

Energy Law and Policy

International Law; Energy and the Environment

U.S. Law: Energy and Environmental

Geopolitics and Geoeconomics of Global Energy

Nuclear Energy Economics and Policy Analysis

Green Engineering and Environmental Compliance

Introduction to Energy and Earth Sciences Economics

Risk Management in Energy Industries

Economic Analysis of Energy in the Environment

Policy and Markets for Biofuels

Energy Economics

Major Energy Options – Issues of Supply and Demand

Energy and Environmental Conflict

The Political Economy of Energy Policy

History of Energy Use and Technology

Energy Systems and Economic Changes: Analysis of Developed and Developing Countries

Electrification and Structural Economic Changes

Energy Markets: Regulation, Deregulation, and In-Between

Economics of Externalities and Market-Based Energy and Environmental Management

Valuation of Benefits and Costs of Energy and Environmental Technologies

The Business of Energy

*Energy as Integral Theme*

ES/NR 4XX/5XX Energy and the Environment

ES/NR 4XX/5XX Environmental Sustainability

Energy and Climate Change: 400 Quadrillion BTU and Counting?

Carbon Sequestration

Welfare Economics of Energy, Food, and the Environment in a Crowded World